AD-A174 985 OPTICALLY PUMPED SHORT WAVELENGTH LASERS(U) YALE UNIV 1/1
NEW HAVEN CT DEPT OF APPLIED PHYSICS M KRISHNAN
31 AUG 85 AFOSR-TR-86-2188 AFOSR-84-0362

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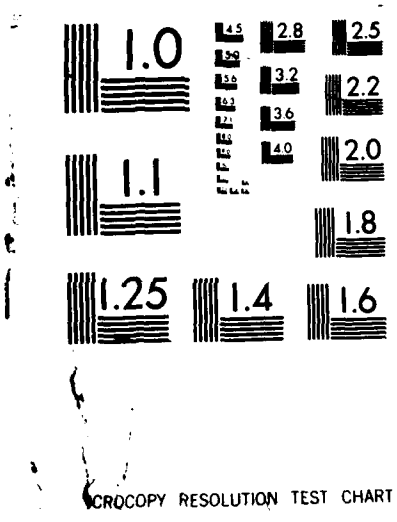
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FINAL REPORT

FOR

AFOSR-84-0362

"Optically Pumped Short Wavelength Lasers"

Prepared by

Professor Mahadevan Krishnan
Department of Applied Physics
Yale University

OBJECTIVES OF THE RESEARCH PROGRAM

The specific purpose of this Grant was to obtain specialized equipment with which to study resonant photo-excitation in Berrylium-like ions. Such photo-excitation could lead to new types of ultraviolet and soft x-ray lasers. The research program itself was funded separately by AFOSR Grant 81-0077, a final report for which has already been submitted. This DoD-URIP Grant was for the sole purpose of acquiring new equipment. Appendix A lists the items of equipment which were purchased during the period August, 1984 to August 1985.

RESULTS ACHIEVED

In August, 1985, the Principal Investigator, M.Krishnan, left Yale University for Physics International Co.(PI). At PI, he is pursuing pulsed power driven x-ray lasers. The equipment acquired at Yale remains uncrated and unused, because of the departure of M.Krishnan and because of the termination of the research Grant (81-0077) on January 31st, 1986.

Since August,1985, M.Krishnan has pursued several options for using this valuable equipment. The Chairman of Applicd Physics at Yale is amenable to the transfer of all the equipment to another academic institution, if it is used in pursuit of this line of research, since no one at Yale will pursue it. Prof. H.Griem of the University of Maryland has offered adequate space

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in his laboratory for this project, and is interested in collaborating with M.Krishnan at PI.

The University of Maryland (U-MD) and PI have submitted research proposals to the DOE, AFOSR and SDIO/IST to obtain funding for this research. To date, no funding has been secured. Since it is deemed pointless to transfer the equipment to U-MD only to have it idle there, the equipment remains at Yale, until research funding becomes available.

This situation is frustrating, because the proof-of-principle experiments at Yale have proven to be very successful. As described in the final report for Grant 81-0077, laser oscillation was demonstrated at 2163 and 2177Å in CIII, pumped by 310Å, MnVI line radiation. The estimated overall (wallplug) efficiency of this type of photo-excited laser is $\sim 10^{-4}$. Soft x-ray lasers with similar overall efficiencies are possible, in higher Z, isoelectronic analogs. U-MD and PI have proposed a concerted effort to scale the CIII sceme to shorter wavelengths. The plan is to study the detailed kinetics at U-MD, using the equipment acquired under this DoD-URIP Grant, while doing complementary experiments using pulsed power drivers at PI. Such a joint research endeavor would make good use of a large amount of expensive capital equipment , enabling the laser development with pulsed power drivers and other equipment provided GFE at PI.

The purpose of this DoD-URIP initiative was to upgrade the equipment available for advanced research at major universi-

ties, allowing them to conduct research programs of interest to DoD research agencies. It is hoped that funds will soon be available to allow the photo-excited lasers proposed in this research to be developed further.

APPENDIX A

EQUIPMENT LIST 1

Principal Investigator: M. Krishnan

Grant/contract ; 653A-31-41155-87AA (DOD-URIP Grant)

Proposed Duration: September 1, 1984 to August 31,1985

A. High Power, Pulsed, CO_2 Laser System

1. Laser

Vendor: Lumonics Inc.

Date Purchased: 9/13/84

1	TEA-601 Oscillator
1	564F Unstable Resonator Front Optic
1	564R 601 Unstable Resonator Rear reflector
1	511 Power Supply

2. Optics for Steering and Focusing the Laser

Vendor: Infrared Optics Inc.
Date Purchased: 10/19/1984

1	5" diameter,20" f.l., AR Coated Ge meniscus Lens
1	5" diameter,20" f.l., AR Coated Ge Cylindrical Lens
2	7" diameter, Si substrate Plane Mirrors

3. Mounts for Optics

Vendor: Ardel Kinamatic

2	Model 19280, 8" Gimbal Mounts w/adaptor,	Yale I.D.:043084 043085
2	Model 19275, 6" lens Mount w/adaptor,	Yalr I.D.: 043086 043340

B. Microprocessor Driven Digital Data AcQuisition Package

1. Digital Instrumentation

Vendor: LeCroy Research Systems

1	1434 Camac Crate	Purchased: 9/13/84
3	TR-3818 100MHz Digitizers	9/13/84
3	Model MM8103A Companion Memories	9/13/84
2	6102 Dual Amplifiers	9/13/84
1	2323 Dual Pulser	9/13/84
1	Camac Crate Controller Model #9801MOD100	12/13/84
1	Catalyst Software Package	12/13/84

C. High Resolution, Extreme Ultra-Violet Monochromator System

1. Monochromator

Vendor: Acton Research Corp.

Date Ppurchased: 9/14/94

1 Acton VM-521-G 1.0m f.l. Monochromator System

2. Pump for Monochromator

Vendor: Balzers, High Vacuum System and Components

Date Purchased: 9/17/84

1 PMS01702 TSH 170 Turbomolecular Pump Station Yale No. 042778

1 UB005079T TSF 010, Emergency Vent Valve

1 PM006125X Splinter Shield TPH/TPU 170

3. Mounts for Imaging Optics

Vendor: Ardel Kinamatic

Data Purchased: 7/19/84

Grant : 624A-31-41135-66AA

2 Component Mount for 1" Dia. Optics

2 High Resolution Uni-Bearing Mount, 2" Dia. for Rod Mounting

END

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